

CLAIMS

1. A method of determining a transmission rate (TxRate) for a WLAN transmitter, the method including:

determining a lookup received signal strength indicator (RSSI) from one or more acknowledgement (ACK) packets;

determining one or more valid data rates, wherein a valid data rate has an RSSI threshold less than or equal to the lookup RSSI;

computing an achievable user throughput for each valid data rate based on a theoretical rate and 1 minus a packet error rate (PER); and

choosing the valid data rate having the highest achievable user throughput as the TxRate.

2. The method of Claim 1, wherein determining the lookup RSSI includes determining a median value of RSSIs from three ACK packets.

3. The method of Claim 1, wherein computing the achievable user throughput includes computing a product of the theoretical rate and the $1 - \text{PER}$.

4. The method of Claim 3, further including:

determining if a size of a frame to be transmitted is greater than a predetermined value; and

if the size is greater, then reducing the lookup RSSI by a predetermined amount before determining valid data rates.

5. The method of Claim 3, further including:

biasing the lookup RSSI based on age before determining valid data rates, wherein an older lookup RSSI is reduced more than a more recent lookup RSSI.

6. The method of Claim 1, further including determining whether the optimal data rate is greater than a maximum data rate (maxRate),

wherein if the TxRate is greater than the maxRate, then determining whether a probe rate is appropriate,

wherein if the probe rate is successful, then resetting the TxRate to one rate higher than the maxRate.

7. The method of Claim 6, wherein if the probe rate is not appropriate, then resetting the TxRate to the maxRate.

8. The method of Claim 1, further including updating a rate control table.

9. The method of Claim 8, wherein updating the rate control table is based on a number of retries to successfully transmit a packet at the TxRate.

10. The method of Claim 9, wherein updating the rate control table is further based on whether the TxRate is a probe rate.

11. The method of Claim 10, wherein if excessive retries are performed, then updating the rate control table includes adjusting the PER and the RSSI threshold of the TxRate.

12. The method of Claim 11, wherein if the TxRate is not a probe rate and the PER is greater than a predetermined value, then

ensuring that data rates above the TxRate have higher RSSI thresholds than that of the TxRate; and

ensuring that data rates below the TxRate have lower RSSI thresholds than that of the TxRate as well as PERs less than or equal to the PER of the TxRate.

13. The method of Claim 10, wherein if excessive retries are not performed, then updating the rate control table includes computing the PER of the TxRate based on the number of retries.

14. The method of Claim 13, wherein if the TxRate is a probe rate and has few retries, then
resetting the PER of the TxRate;
significantly reducing a probe interval; and
setting maxRate to the probe rate.

15. The method of Claim 14, wherein if the TxRate is not a probe rate and has no retries on a predetermined number of packets sent at TxRate, then reducing the RSSI threshold of the TxRate.

16. The method of Claim 15, wherein if the TxRate is not a probe rate and the PER is greater than a predetermined value, then

ensuring that data rates above the TxRate have higher RSSI thresholds than that of the TxRate; and

ensuring that data rates below the TxRate have lower RSSI thresholds than that of the TxRate as well as PERs less than or equal to the PER of the TxRate.

17. The method of Claim 8, wherein updating the rate control table includes periodically aging values.

18. The method of Claim 17, wherein aging values includes: reducing RSSI thresholds by a predetermined amount; and reducing PERs by a predetermined factor.

19. A transmission rate for a packet, the transmission rate being computed based on a received signal strength indicator (RSSI) of one or more packets, RSSI thresholds of possible data rates, theoretical rate values of the possible data rates, and packet error rates (PERs) of the possible data rates.

20. The transmission rate of Claim 19, the transmission rate being further computed based on a size of a frame to be transmitted.

21. The transmission rate of Claim 19, the transmission rate being further computed based on an age of the multiple acknowledgement packets.

22. An computer-implemented program for determining a transmission rate (TxRate) in a WLAN transmitter, the computer-implemented program comprising:

- a first set of instructions for determining a lookup received signal strength indicator (RSSI) from one or more acknowledgement (ACK) packets;

- a second set of instructions for determining one or more valid data rates, wherein a valid data rate has a stored RSSI value less than or equal to the lookup RSSI;

- a third set of instructions for computing an achievable user throughput for each valid data rate based on a theoretical rate and a packet error rate (PER); and

- a fourth set of instructions for choosing the valid data rate having the highest achievable user throughput as the TxRate.

23. The computer-implemented program of Claim 22, wherein the first set of instructions for determining the lookup RSSI includes instructions for determining a median value of RSSIs from three ACK packets.

24. The computer-implemented program of Claim 22, wherein the third set of instructions for computing the achievable user throughput includes instructions for computing a product of the theoretical rate and 1 minus the PER.

25. The computer-implemented program of Claim 24, further including:

a fifth set of instructions for determining if a size of a frame to be transmitted is greater than a predetermined value; and

if the size is greater, then a sixth set of instructions for reducing the lookup RSSI by a predetermined amount before determining valid data rates.

26. The computer-implemented program of Claim 24, further including:

a fifth set of instructions for biasing the lookup RSSI based on age before determining valid data rates, wherein an older lookup RSSI is reduced more than a more recent lookup RSSI.

27. The computer-implemented program of Claim 22, further including a fifth set of instructions for determining whether the optimal data rate is greater than a maximum data rate (maxRate), wherein if the TxRate is greater than the maxRate, then the computer-implemented program further comprises a sixth set of instructions for determining whether a probe rate is appropriate,

wherein if the probe rate is appropriate, then the computer-implemented program further comprises a seventh set of instructions for resetting the TxRate to one rate higher than the maxRate.

28. The computer-implemented program of Claim 27, wherein if the probe rate is not appropriate, then the computer-implemented program further comprises an eighth set of instructions for resetting the TxRate to the maxRate.

29. The computer-implemented program of Claim 22, further including a fifth set of instructions for updating a rate control table.

30. The computer-implemented program of Claim 29, wherein updating the rate control table is based on a number of retries to successfully transmit a packet at the TxRate.

31. The computer-implemented program of Claim 30, wherein updating the rate control table is further based on whether the TxRate is a probe rate.

32. The computer-implemented program of Claim 31, wherein if excessive retries are performed, then the fifth set of instructions for updating the rate control table includes instructions for adjusting the PER and the RSSI threshold of the TxRate.

33. The computer-implemented program of Claim 32, wherein if the TxRate is not a probe rate and the PER is greater than a predetermined value, then the computer-implemented program further comprises:

a sixth set of instructions for ensuring that data rates above the TxRate have higher RSSI thresholds than that of the TxRate; and

a seventh set of instructions for ensuring that data rates below the TxRate have lower RSSI thresholds than that of the TxRate as well as PERs less than or equal to the PER of the TxRate.

34. The computer-implemented program of Claim 29, wherein if excessive retries are not performed, then the fifth set of instructions for updating the rate control table includes instructions for updating the PER of the TxRate based on the number of retries.

35. The computer-implemented program of Claim 34, wherein if the TxRate is a probe rate and has few retries, then the computer-implemented program further comprises a sixth set of instructions for resetting the PER of the TxRate, significantly reducing a probe interval, and setting maxRate to the probe rate.

36. The computer-implemented program of Claim 35, wherein if the TxRate is not a probe rate and has no retries on a predetermined number of packets sent at TxRate, then the computer-implemented program further comprises a seventh set of instructions for reducing the RSSI threshold of the TxRate.

37. The computer-implemented program of Claim 36, wherein if the TxRate is not a probe rate and the PER is greater than a predetermined value, then the computer-implemented program further comprises:

an eighth set of instructions for ensuring that data rates above the TxRate have higher RSSI thresholds than that of the TxRate; and

a ninth set of instructions for ensuring that data rates below the TxRate have lower RSSI thresholds than that of the TxRate as well as PERs less than or equal to the PER of the TxRate.

38. The computer-implemented program of Claim 29, wherein the fifth set of instructions for updating the rate control table includes instructions for periodically aging values.

39. The computer-implemented program of Claim 38, wherein the instructions for aging values includes:

instructions for reducing RSSI thresholds by a predetermined amount; and

instructions for reducing PERs by a predetermined factor.